

# Pb or Pb-Bi Cooled “Battery” Concept Set (L6) Exhaustive Listing Viability Phase R&D



1. **Fuel/Clad/Coolant Compatibility Performance**  
 Key Viability: Pb-Bi@550°C  
 Long Lead: Pb at 800°C  
 TRU Zr Alloy & TRU Nitride in Ferritic Steel (Th option)  
 TRU Nitride in e.g SiC composite or coated alloy
2. **Neutronics & Control**  
 Selected Nuclear Data (Pb, Bi)  
 Reanalysis of existing critical experiments  
 Benchmarks of heterogeneous open lattices  
 Thermostructural reactivity feedback modeling
3. **Open Lattice Heat Removal: (fuel lattice, IHX tubes)**  
 Heat transfer correlations  
 Pressure drop correlations  
 Redistribution in ductless assemblies  
 Natural (and forced) circulation flow regimes
4. **Heat Transport & Components**  
 Screen & Select Materials of Construction for IHX Service in Pb/He, Pb/CO<sub>2</sub>, Pb/Molten Salt, He/HBr + Steam, CO<sub>2</sub>/HBr & Steam, MS/HBr & Steam  
 High Temp. Code Case Development  
 Δp form factors for pool flows in natural circulation  
 Lift pump development
5. **Structures/Shielding/Refueling**  
 Seismic isolation development  
 High Temperature concrete & code case development  
 Fab Development of High Temperature Structural Components (adapt aerospace materials and fab?)
6. **Overall Safety Strategy**  
 Covered Elsewhere: Passive decay Heat Removal; Passive reactivity self regulation; flow redistributions; neutronics and feedbacks benchmarks  
 Fuel/Clad/Coolant Phenomenology under Severe Accident Conditions  
 In-vessel IHX or SG tube Rupture Phenomenology
7. **O&M Strategy**  
 Measurability Procedure for Passive Feedbacks  
 Po Management  
 In-service Inspection of structures  
 Secure Remote Monitoring Technology
8. **Fabricability & Capital Cost Strategy**  
 Adaption of Modern High Temperature Material Fabrication from Other Industries  
 Modularization/Factory Fab/Transport Strategies  
 Adapt Integrated Software-based Design/Fab/Transport/Install/Startup/Monitor/Maintain technologies from other industries
9. **Fuel Cycle**  
 Nitride Fuel Pyro including N15 recovery  
 N15 Enrichment  
 Remote Fabrication (vibro)  
 (Th fuel option)
10. **Energy Converters**  
 Supercritical CO<sub>2</sub> Brayton Cycle  
 Optimize Cycle  
 Small Scale Testing  
 CaBr Water Cracking  
 Materials Selection  
 Ca Support  
 Properties Measurement  
 Rate Constants  
 Flowsheet  
 Bench Scale  
 Prototype Design  
 Desalinization  
 Adapt Work by Others  
 Reverse Osmosis  
 Multi Stage Flash  
 Multi-Effects Distillations